UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/845,985	04/30/2001	Benjamin Chaloner-Gill	N19.12-0047	2942

24113 7590 06/30/2006

PATTERSON, THUENTE, SKAAR & CHRISTENSEN, P.A.
4800 IDS CENTER
80 SOUTH 8TH STREET
MINNEAPOLIS, MN 55402-2100

EXAMINER	
RUTHKOSKY, MARK	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 06/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/845,985	CHALONER-GILL ET AL.	
	Examiner	Art Unit	
	Mark Ruthkosky	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-10,12,14-21,48-50 and 52-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-10,12,14-21,48-50 and 52-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This office action is in response to the amendment filed on 3/29/2005.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-4, 6-10, 12-21 and 48-61 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In the claims, the phrase, "less than about" is indefinite as the limitation, "less than" describes a definite maximum value, while the word "about" contradicts that value. Further, the phrase "greater than about" is indefinite as the limitation, "greater than", describes a definite minimum value while the word "about" contradicts that value. The same reasoning is applied to the phrase "at least about," for example in claim 53. As shown in the MPEP, section 2173.05(b), section (a), the phrase "at least about" is held as indefinite. The same reasoning is applied to the phrase, "less than about." It is noted that prior art has been applied with respect to the claimed particle size.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 6-7, 10, 12, 14-17, 19-21, 48-50, 52-53 and 55-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamauchi et al. (US 5,538,814), in view of Manev (US 5,789,115.)

The instant claims are to a collection of particles comprising a crystalline composition with a phosphate anion and a lithium cation; the collection of particles has an average particles size of less than about 1000 nm and i) having essentially no particle with a diameter greater than about 5 times the average particle size (independent claims 1 and 21,) OR ii) having a distribution of particle sizes such that at least about 95 percent of the particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter (independent claims 55 and 58.)

Kamauchi et al. (US 5,538,814) teaches a lithium secondary battery with a lithium cobalt phosphate active material with an average particle size of 10 nm to 20 μm (see claims 1-14, claim 3.) Other metals may be added to the active material (col. 4, lines 10-65.) Lithium, cobalt and nickel are included in the active material of example 4. The material may be crystalline or amorphous (see col. 6, lines 1-20.) The material may be of the formula $LiCoPO_4$ with Fe substituted for the Co (see column 4, lines 15-55.) Various substituents may be substituted into the lithium transition metal oxide complex (col. 1, lines 55-67.) The lithium transition metal oxide active material is uniformly blended and formed into a positive electrode. With regard to the phrases "less than about," "greater than about," and "at least about" in the claims, the

reference is considered to include points both within and "about" the end points of the range based on the teachings of 10 nm to 20 μm.

The reference does not teach that the collection of particles has essentially no particle with a diameter greater than about 3 times or 5 times the average particle size OR that at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter.

Manev (US 5,789,115) teaches cathode materials for a lithium battery. Manev teaches that the mean particle size and the particle size distribution are two of the basic properties characterizing the positive electrode intercalation materials for lithium secondary batteries. The properties are important because they directly influence the charge-discharge rate capacity, the safety cell performance and other features of the battery. A decrease in the mean particle size and the distribution typically results in an increase in the cycleability of these electrode active materials (col. 1, lines 34-50.) Smaller particles are relatively more flexible and cycling does not damage the material to the degree of larger particles. Based on the teachings of Kamauchi and Manev, it would be obvious to one of ordinary skill in the art at the time the invention was made to prepare an electrode of a collection of particles for an electrode material of Kamauchi having a greater number of particles as close in size to the desired average diameter as possible, as the average diameter has been shown to be critical to the invention (see Kamauchi col. 5, lines 25-end; Manev col. 1, lines 34-50.) The Kamauchi reference teaches a uniformly blended mixture where no undesirably large, irregular pores are formed in the electrode. These irregular pores cause cracks and defects that decrease the capacity of the electrode. Having a greater range of active material particle sizes will cause a less uniform blended mixture, which is taught to be

undesirable by the reference. One of ordinary skill in the art has the knowledge, based on Kamauchi and Manev, to prepare or select particles of preferred sizes by pulverizing or filtering the materials. Further, one of ordinary skill in the art would be motivated to choose specific particles of the average diameter for the electrode, as particles of this diameter are taught to increase the capacity of the electrode (col. 5, lines 30-35.) Pulverizing the particles will provide particles in the nanometer scale range (col. 5, lines 30-36.) It is noted that MPEP 2144.05(b) notes that optimization of ranges within prior art conditions or through routing experimentation is not inventive. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 8-9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodenough et al. (US 5,910,382), and further in view of Kamauchi et al. (US 5,538,814) and Manev, as applied in the previous section.

Goodenough et al. (US 5,910,382) teaches cathode materials for a lithium secondary battery including $LiFePO_4$ and $LiFe_{1-x}Mn_xPO_4$, where x is between 0 and 1. The anode is lithium metal or a lithium intercalation material (see col. 1.) The reference is silent to the size of the active material particles. Thus, the reference does not teach that the collection of particles has essentially no particle with a diameter greater than about 3 times or 5 times the average particle size OR that at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter.

Kamauchi et al. (US 5,538,814) teaches a lithium secondary battery with lithium transition metal oxide complexes, including a lithium cobalt phosphate cathode active material

with an average particle size of 10 nm to 20 μm (see col. 5, line 25 to col. 6, line 20 and claims 1-14.) Other metals may be added to the active material including iron and manganese (col. 1, lines 55-end and col. 4, lines 10-65.) The electrode material is pulverized into particles having an average size of 10 nm to 20 μm. Manev (US 5,789,115) teaches cathode materials for a lithium battery. Manev teaches that the mean particle size and the particle size distribution are two of the basic properties characterizing the positive electrode intercalation materials for lithium secondary batteries. The properties are important because they directly influence the charge-discharge rate capacity, the safety cell performance and other features of the battery. A decrease in the mean particle size and the distribution typically results in an increase in the cycleability of these electrode active materials (col. 1, lines 34-50.) Smaller particles are relatively more flexible and cycling does not damage the material to the degree of larger particles. The figures show various particle distributions. It would be obvious to one of ordinary skill in the art at the time the invention was made to prepare the cathode materials of Goodenough et al. (US 5,910,382) with a size of less than 1000 nm, as small sizes provide an increased surface area and uniform dispersion through the electrode, which increases the capacity of the positive electrode as shown by Kamauchi et al. (US 5,538,814.)

Based on the teachings of Kamauchi and Manev, it would be obvious to one of ordinary skill in the art at the time the invention was made to prepare an electrode of a collection of particles for an electrode material of Kamauchi having a greater number of particles as close in size to the desired average diameter as possible, as the average diameter has been shown to be critical to the invention (see Kamauchi col. 5, lines 25-end; Manev col. 1, lines 34-50.) The Kamauchi reference teaches a uniformly blended mixture where no undesirably large, irregular

pores are formed in the electrode. These irregular pores cause cracks and defects that decrease the capacity of the electrode. Having a greater range of active material particle sizes will cause a less uniform blended mixture, which is taught to be undesirable by the reference. One of ordinary skill in the art has the knowledge, based on Kamauchi and Manev, to prepare or select particles of preferred sizes without grinding or by pulverizing or filtering the materials. Further, one of ordinary skill in the art would be motivated to choose specific particles of the average diameter for the electrode, as particles of this diameter are taught to increase the capacity of the electrode (Kamauchi, col. 5, lines 30-35.) Pulverizing the particles will provide particles in the nanometer scale range (Kamauchi, col. 5, lines 30-36.) It is noted that MPEP 2144.05(b) notes that optimization of ranges within prior art conditions or through routing experimentation is not inventive. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 54-56, 58, 59 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bodiger et al. (US 5,849,827), in view of Bi et al. (US 5,952,125.)

Bodiger et al. (US 5,849,827) teaches a collection of particles of inorganic powders including aluminum phosphate. The particles have a mean particle diameter of 1-50 nm (see claims 1-9.) The particles are finely divided inorganic powders (claim 9.) The reference is silent to the crystallinity of the material and does not suggest that the material is either crystalline or amorphous. It would be obvious to one of ordinary skill in the art at the time the invention was made to prepare the powder either as a crystalline material or as an amorphous material as the material will provide a significant reduction in burning times in a molding composition

regardless of the state of crystallinity. One of ordinary skill in the art would recognize that the crystallinity of the material will not affect the properties of the composition.

The reference does not teach that the collection of particles that has at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter. Bi et al., however, teaches forming cathode active materials having a high degree of uniformity with a particle distribution where at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter (col. 8, lines 27-42.) It would be obvious to one of ordinary skill in the art at the time the invention was made to prepare a mixture with at least 95 percent of the particles having a diameter greater than about 40 percent and less than about 160 percent of the average diameter, as taught in Bi to give improved characteristics such as energy density and capacity (col. 2, lines 12-20.) One of ordinary skill in the art would recognize that when a desired average diameter is disclosed in the prior art, choosing particles close to that diameter would be desirable for the function described in the reference. Thus, a collection of particles chosen to have a diameter of at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter would be desirable as the finely divided inorganic powder in the thermoplastic molding taught by Bodiger et al. These materials will function as the extremely finely divided material in the electrodes taught by Bodiger. MPEP 2144.05(b) notes that optimization of ranges within prior art conditions or through routing experimentation is not inventive. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Response to Arguments

Applicant's arguments filed 4/6/2006 have been considered but they are not persuasive.

Declaration under 37 CFR 1.132: Applicant submission of the declaration filed 4/6/2006 is noted. The declaration shows evidence that the particle distribution of the electrode active material found in Kamauchi, as applied in the rejection under 35 U.S.C. 103, is greater than 5 times the average particle size. The data is the declaration appears to support this conclusion, however, the rejection is based on obviousness and particularly that it would be obvious to prepare an electrode of a collection of particles from the electrode material taught in Kamauchi having a greater number of particles as close in size to the desired average diameter as possible, because the average diameter has been shown to be critical to the invention. Although the data in the reference does support the argument that the reference does not teach a collection of particles having essentially no particle with a diameter greater than about 5 times the average particle size, the rejection noted that this element of the claim was not taught by Kamauchi. "The reference does not teach that the collection of particles has essentially no particle with a diameter greater than about 3 times or 5 times the average particle size OR that at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter.", (page 4 of the final rejection of 6/14/2005.) For this reason, the declaration does not provide evidence to overcome the rejection.

Rejections based on 35 U.S.C. 112 2nd paragraph: With regard to the rejection under 35 U.S.C. 112 2nd paragraph, the claims incorporate the phrases, "at least about," "less than about" and "greater than about." The phrases are indefinite as the limitations, "less than and greater than" describe a definite minimum and maximum value, while the word "about" contradicts that

value. The applicant argues that the claims are clear to one of ordinary skill in the art. With regard to applicant's arguments, a person of ordinary skill in the art is simply that. A person may understand what the language less than about means in a broad context, however, in dealing with a claim limitation, one of ordinary skill in the art would need to determine where the end point on the claimed range must lie. This point is not clear. Would it be 1001 nm or1002 nm or 1010 nm or 1050 nm? During examination this value is given it's broadest reasonable interpretation. Each of those values contradicts the end point defined in the claim of less than 1000 nm. As the end point is not clearly defined, the claim is indefinite. The applicants cites that the precision of a number is not limited by the phrases, "less than", "greater than" or "at least" with regard to support in a disclosure. While this may or may not be true, 35 U.S.C. 112 2nd paragraph requires a claim to distinctly claim the subject matter which the applicant regards as his invention. As shown in the MPEP, section 2173.05(b), the phrase "at least about" is held as indefinite where there is close prior art and nothing in the specification, prosecution history or prior art to provide an indication of what range of specific activity is covered by the term "about," with the MPEP citing Amgen Inc. vs. Chugi Pharmaceutical Co. Ltd. As the average particle sizes in the claims are found in the prior art, the prior art is considered close prior art and the rejection is deemed proper.

Rejections based on 35 U.S.C. 103(a): With regard to the applicant's arguments to the rejection under 35 U.S.C. 103(a) as being unpatentable over Kamauchi et al. (US 5,538,814), it is noted that Kamauchi et al. (US 5,538,814) teaches a lithium secondary battery with a lithium cobalt phosphate active material with an average particle size of 10 nm to 20 μm (see claims 1-14.) The applicant argues that reasonable motivation has not been provided for modifying the

invention of Kamauchi to give a collection of particles that has essentially no particle with a diameter greater than about 3 times or 5 times the average particle size OR that at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter. Further, the applicant argues that it is speculation that the uniformity of particles is significant.

The reference teaches a uniformly blended mixture such that undesirably large, irregular pores are not formed in the electrode (see col. 5, lines 1-35.) These irregular pores cause cracks and defects that decrease the capacity of the electrode. Having a greater range of active material particle sizes will give a less uniform blended mixture, which is taught to be undesirable by the reference. Further, one of ordinary skill in the art would be motivated to choose specific particles of the average diameter for the electrode, as particles of this diameter are taught to increase the capacity of the electrode (col. 5, lines 30-35.) Pulverizing the particles provide particles in the nanometer scale range (col. 5, lines 30-36.) MPEP 2144.05(b) notes that optimization of ranges within prior art conditions or through routing experimentation is not inventive.

The arguments with respect to the rejection based on Goodenough et al. and Kamauchi et al, are based on the above arguments to the Kamauchi reference and have been addressed in the previous section.

Examiner Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The

examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mark Ruthkosky
Primary Patent Examiner
Art Unit 1745

6.23.2006